

05 Decimal numbers

THE WORLD ENVIRONMENT DAY OF 2000

For the world environment day of 2000, the Junta de Extremadura published a very curious poster.

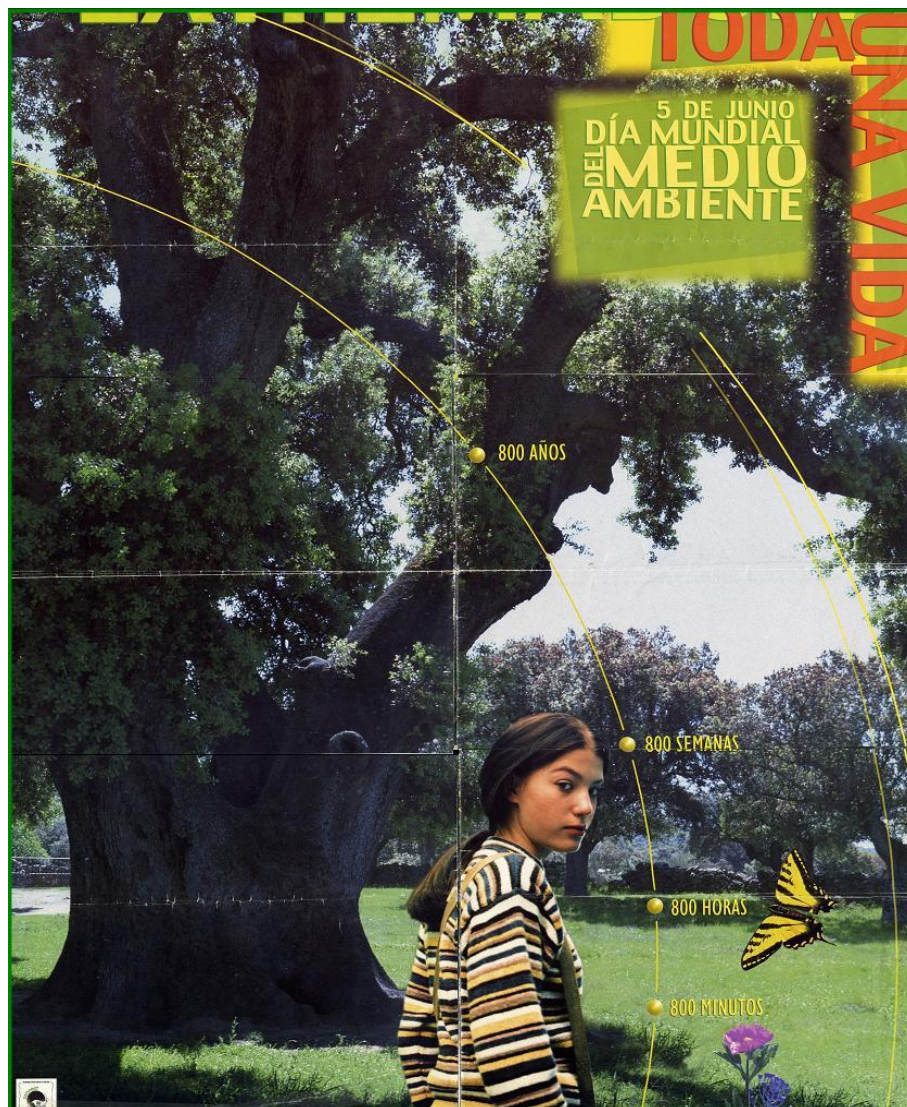
You can see four different objects on the poster.

The biggest is an enormous tree called 'La Terrona'; it is in Zarza de Montánchez. People say that this is a centenary tree with a huge perimeter. It is necessary to have about five people with their arms extended to surround the trunk. The tree is 8 hundred years old.

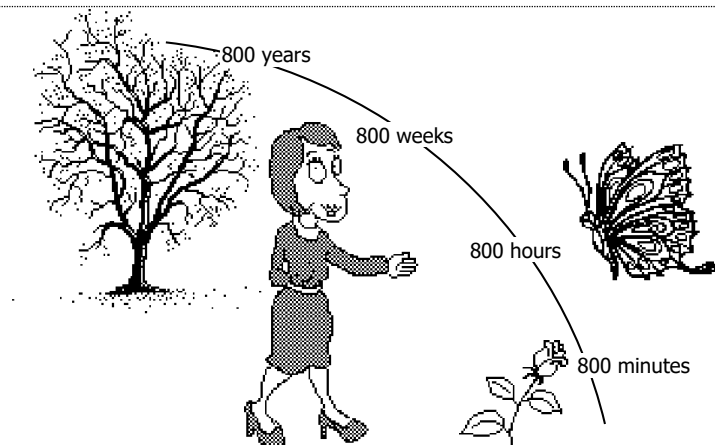
The next being is a pretty girl who is 8 hundred weeks old. The next is a curious butterfly which is 8 hundred hours old. And finally there is a fragile flower which is only 8 hundred minutes old.

Everybody is 8 hundred but in a different way, in a different unit of measure.

The arc is a symbol to show that all living things are related. We share a life with many different features but they are always beautiful.



1. What is the poster date?	2. What do you see on the poster?
3. What is the title of the poster?	4. How old is the tree? What year was the tree planted?
5. How old is the girl? When was the girl born?	6. How old is the butterfly? What is its date of birth?
7. How old is the violet?	



1. DECIMAL FORM OF A NUMBER

It is a way to represent no integer quantities. We will use a simple symbol to express the no integer part: the decimal point.

The way to get this is to divide the unit in 10 parts and so on. These are the decimal fractions.

The decimal fraction units are the following: $\frac{1}{10} = 0'1$ –one tenth-; $\frac{1}{100} = 0'01$ –one hundredth -; $\frac{1}{1000} = 0'001$ –one thousandth-, $\frac{1}{10000} = 0'0001$ –one ten-thousandth- etc.

For instance, $235.473 = 2 \cdot 100 + 3 \cdot 10 + 5 + 4 \cdot \frac{1}{10} + 7 \cdot \frac{1}{100} + 3 \cdot \frac{1}{1000}$

Whole part $\leftarrow \boxed{235} \mid \boxed{473} \rightarrow$ Decimal part.

ROUNDING DECIMAL NUMBERS

Sometimes we have to reduce some decimal because it doesn't make sense to put a lot of decimal in a number.

Round a decimal number to a given order is the result of:

Increase the digit by 1 if the next digit is 5 or greater (this is called rounding up)

Leave it the same if the next digit is less than 5 (this is called rounding down).

Round to hundredths 3.14159265... \rightarrow

Round to ten-thousandths 3.14159265... \rightarrow

In other words, it is the way to take the best approximation to the number.

2. OPERATIONS WITH DECIMAL NUMBERS

ADDITION AND SUBTRACTION

We have to operate according to the comma or point position.

For example,

$$\begin{array}{r} 26.79 \\ + \quad 0.4085 \\ + \quad 4.0 \\ + \quad 528.254 \\ \hline 559.4525 \end{array}$$

$$\begin{array}{r} 83.500 \\ - \quad .508 \\ \hline 82.992 \end{array}$$

MULTIPLICATION

We have to multiply in a normal way and then put as many decimal places as the sum of the two numbers have.

For example, complete you the number of decimals for the result.

DIVISION

The easiest way to divide decimal numbers is taking away the decimal part from the divisor by multiplying by the same suitable power of ten

$$\begin{array}{r} 4.56 \\ \times 1.7 \\ \hline 3192 \\ 4560 \\ \hline 7752 \end{array}$$

dividend and divisor.

After that we divide in a normal way adding a decimal point when we begin with the decimal part of the dividend.

For example,

$$21,66 : 3,8 \longrightarrow \begin{array}{r} 216,6 \\ 38 \overline{) 216,6} \\ \underline{266} \\ 00 \end{array}$$

Example:

Work out and give your result to two decimal places: $257284 \div 734$

POWERS

You have to multiply the base number as many times as the exponent value.

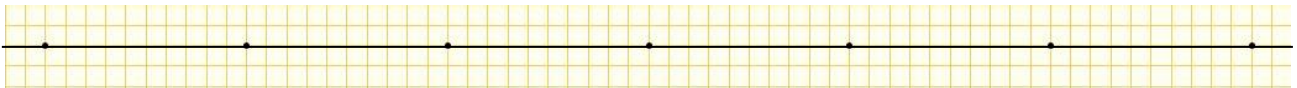
Example:

Calculate the following power: $2 \cdot 5^3$

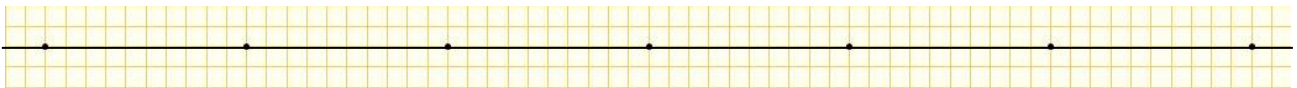
EXERCISES AND PROBLEMS

1. DECIMAL FORM OF A NUMBER

1. Order the following decimal numbers from largest to smallest:
a) 5.4; 5.004; 5.0004; 5.04; 4.4; 4.98; 5; 5.024
b) -7.3; -7.003; -7.0003; -7.03; -6.5; -6.87; -7; -7.037
2. Put in order lowest to highest these numbers: -6,7; -6,712; -6,709; -6,08
3. Put in order lowest to highest these numbers: -5'7; -5'12; -5'102; -5'072
4. Put in order lowest to highest these numbers: -3'5; -3'23; -3'203; -3'052
5. Write two numbers between -3,012 y -3,02;
6. Order lowest to highest: -5,4; -5,39; -5,401; -5,3842
7. Represent on the number line: 0'7; -0'5; 2'3; -1'5. As you can see in the picture you have to divide each unit into 10 parts



8. Represent the following numbers in the numerical line: 0'6; -0'3; 2'7; -1'2



9. Represent the following numbers in the number line: -2,3; 1,6; -3,1; 2,7



2. OPERATIONS WITH DECIMAL NUMBERS

10. Work out: $803'25 - 34'876 \cdot 7'5$
11. Calculate and check your answer. Give your result to two decimal places:
 $520'687 \div 65'9$
12. Do the division to two decimal places: $76548'23 : 832'7$
13. Work out and check your answer. Give your result to two decimal places: $N721'85 : 76'5$
14. Work out and check your answer. Give your result to two decimal places: $N70'3 : 78'35$.
15. Work out and check your answer. Give your result to two decimal places: $N3'467 : 9'72$.
16. Work out: $605'94 - 31'7 \cdot 6'07 =$
17. Calculate $(87'25 - 23'508) \cdot 7'5 =$
18. Calculate: $324 : 0.018 =$; $12.96 : 6 =$
19. Work out: a) $184'5 \cdot 1000$; b) $48'5 \cdot 1000$; c) $13'52 \cdot 0'0001$; d) $45'7 \cdot 0'0001$
20. Work out: a) $184'5 : 1000$; b) $48'5 : 1000$; c) $13'52 : 0'0001$; d) $45'7 : 0'0001$
21. Calculate:
 $3.6669 \cdot 1000 =$; $0.036 \cdot 10 =$; $0.000012 \cdot 10\ 000 =$ $26.36 \cdot 10\ 000 =$; $0.261 \cdot 100 =$

- 22.** Calculate:
 $3.6669 : 1000 =$; $0.036 : 10 =$; $123.005 : 10\,000 =$; $2.36 : 1000 =$; $5.036 : 10 =$
- 23.** Work out: a) $0,0234 : 1000$; b) $0,00786 \cdot 1000$; c) $453,21 : 0'001$; d) $23,5 \cdot 0'001$

3. POWERS and ROOTS

- 24.** Calculate: a) $(-1,2)^2$; b) $(0,4)^3$; c) $(-0,2)^4$
- 25.** Work out the value for each using the definition of a power:
 a) $0'2^3$; b) $2'1^4$; c) $0'5^{-2}$; d) $2'5^2$
- 26.** Calculate: $3 + 5 \cdot \sqrt{6'25} - (2'8 - 2 \cdot 1'2^2) : 2$.
 Advice: Work out first $\sqrt{6'25}$ and $1'2^2$ then use them in the expression
- 27.** Calculate: $3 + (2,1^2 - 2 \cdot 3) - 3,3\sqrt{1,21} : 3 =$
- 28.** Calculate: $2'2^2 : 0'66 - 5'06 \cdot 9'4 + \sqrt{1'21}$. Give your result to two decimal places.
- 29.** Calculate: $3 + 5\sqrt{6,25} - (2,8 - 2 \cdot 1,2^2) : 2$
- 30.** Calculate: $6'6^2 : 0'22 - 5'06 \cdot 9'4 + \sqrt{1'44}$. Give your result to two decimal places.

4. PROBLEMS

- 31.** A water jug weighs 0.64 kg when empty and 1.728 kg when filled with water. How much does the water weigh?
- 32.** In a well filled with water, 184.5 litres are removed followed by 128.75 litres and finally by 84.5 litres. After these withdrawals, there are 160 litres in the well. How much water did the well originally have?
- 33.** A trader buys 648 litres of milk at 0'32 € per litre. At what price does he have to sell each litre to earn 213'84 € in total?
- 34.** A car travels 512 kilometres by 42'5 litres of fuel. How many litres does a car use for 100 kilometres?
- 35.** A book has 250 sheets. The book is 4'3 cm wide. How many millimetres wide is each sheet?
- 36.** Eva is on a diet which states that she cannot consume more than 600 kilocalories in one meal. Yesterday she had lunch: 125 g of bread, 140 g of asparagus, 45 g of cheese and an apple of 130 g. If 1 g of bread has 3.3 kilocalories, 1 g of asparagus, 0.32, 1 g of cheese, 1.2, and 1 g of an apple 0.52. Did Eva follow her diet?
- 37.** There are 240 boxes with 25 bags of coffee each. If each bag weighs 0.62 kg, what is the total weight of all the coffee?
- 38.** A book has 150 sheets. The book is 3'4 cm wide. How many millimetres wide is each sheet?
- 39.** Knowing that $2,077 \text{ m}^3$ air weighs 2.7 kg, calculate how much 1 m^3 of air weighs.
- 40.** A cyclist has travelled 145.8 km in the first stage of a race, 136.65 km in the second stage and 162.62 km in the third. How many kilometres more must the cyclist complete if the entire race is 1000 km in length?